IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:

Mamoru UCHIDA et al.

Serial Number: 09/627,424

Filed: July, 27, 2000

For: STUDLESS TIRE

Group Art Unit: 1733

Examiner: MAKI, STEVEN D.

DECLARATION UNDER 37 CFR 1.132

Commissioner for Patents
Washington, D.C. 20231

Sir:

Akira Minagoshi residing at 3-6-37, Tarumi-cho, Suita-shi, Osaka, Japan duly deposes and says:

1. That he graduated from Department of Applied Chemistry, Faculty of Engineering, KUMAMOTO UNIVERSITY, Kumamoto, Japan, in the year 1993, and he received the degree of Master of Applied Chemistry from GRADUATE SCHOOL OF KUMAMOTO UNIVERSITY, Kumamoto, Japan in the year 1995;

2. That since 2001, he has been employed in the capacity of Sumitomo Rubber Industries, Ltd.;

3. That from 2001 he has been engaged in development for compound in a studless tire used for a compact car (PC, LT).;

4. That he has read and is familiar with the instant application for United States Letters Patent and Office Action thereto mailed January 28, 2003.; and

5. That he has made experiments in order to show that, even

in the case that a tread is obtained by a method other than rolling with a calender roll and repeatedly folding, the elements of Claim 1 can be satisfied and that in such a case, the obtained tire has excellent braking performance on ice and abrasion resistance.

Experiment

Experiments 1 and 2

A rubber composition was prepared according to the compounding ratio shown in Table 1. Then, as shown in Fig. 1, the rubber composition containing staple fibers was rolled by calender roll 1 and the obtained rubber sheet 3 was cut perpendicularly to extrusion direction B. Each cut piece was rotated 90 degrees and laminated on one another to prepare a rubber sheet in which staple fibers 2 were oriented in the tread thickness direction. The obtained rubber sheet 3 was used in a tire tread and a tire was molded and obtained. Using the obtained tire, the average length, complex elastic modulus, braking performance on ice, abrasion resistance and rubber hardness of the staple fibers in the rubber were measured in the same way as in Example 1 of the instant specification. The results are shown in Table 1.

Experiments 3 and 4

A rubber composition was prepared according to the compounding ratio shown in Table 1. Then, using the apparatus shown in Fig. 2, the rubber composition was extruded into a tube and as shown in Fig. 3, a rubber sheet was obtained, in which the staple fibers were oriented in orientation direction A perpendicular to extrusion direction B. As shown in Fig. 4, the obtained rubber sheet was cut in small intervals

parallel to extrusion direction B and each piece was rotated 90 degrees and laminated on one another to obtain a rubber sheet in which the staple fibers were oriented perpendicularly to the rubber sheet surface. The obtained rubber sheet was used in a tire tread and a tire was molded and obtained. Using the obtained tire, the average length, complex elastic modulus, braking performance on ice, abrasion resistance and rubber hardness of the staple fibers in the rubber were measured in the same way as in Example 1 of the instant specification. The results are shown in Table 1.

The apparatus shown in Fig. 2 is described below. Rubber composition 4 is transported from extruder 5 (screw part) to extruder 6 (head part) and extruded from die 7. Rubber composition 4 extruded from die 7 is pressed against the center of disc 8 and spreads out into a circle between disc 8 and outer wall 12 to become a sheet. Then, the rubber sheet passes through tube-shaped extrusion port 9 and extruded into a tube. Rubber sheet 10 extruded into a tube is extruded by partially cutting with knife 11 in the extrusion direction.

The apparatus has a special extrusion head comprising head 6, die 7, disc 8, tube-shaped extrusion port 9 and knife 11. Therefore, when extruded from the mouth ring, the rubber is pressed against the center of disc 8 and the rubber spreads out into a circle from the center. At this time, the force of the rubber spreading in the circumferential direction is stronger than the force of the rubber moving outward and the staple fibers orient in the circumferential direction. By extruding this rubber into a tube, rubber sheet 10 is obtained, in which staple fibers are oriented in the circumferential direction of the tube.

Table 1

	Ex. 1	Ex. 2	Ex. 3	Ex. 4
Natural rubber	60	60	70	70
High-sys Polybutadiene	40	40	30	30
Carbon Black N220	40	40	45	45
Silica	15	15	-	-
Silane coupling agent	1.2	1.2	-	-
Paraffin oil	20	20	15	15
Wax	2	2	2	2
Antioxidant	1.5	1.5	2	2
Stearic acid	2	2	3	3
Zinc oxide 1	3	3	-	-
Zinc oxide 2	-	-	5	5
Glass fiber	15	-	10	5
Carbon fiber	-	15	-	-
Curing Accelerator	1	1	1.5	1.5
Sulfur	1.5	1.5	1	1
Average length of staple fibers (mm)	0.5	0.5	0.5	0.5
Aspect ratio of staple fibers	15.2	27.8	15.2	15.2
Complex Elastic Modulus E1	7.2	9.5	4.8	3.9
Complex Elastic Modulus E2	3.3	3.2	2.4	2.5
E1/E2	2.18	2.97	2.00	1.56
Rubber hardness	65	63	59	57
Braking Performance on ice	112	113	128	124
Abrasion Resistance	94	95	95	92

Natural rubber: RSS#3 grade

High sys polybutadiene: UBEPOL BR150B available from Ube Industries, Ltd.

Carbon black 220: SHO BLACK N220 available from Showa Cabot Co., Ltd.

Silica: Nipsil VN3 available from Nippon Silica Co., Ltd.

Silane coupling agent: Si69 (bis (3-triethoxysilylpropyl) tetrasulfide) available from Degusa Co., Ltd.

Paraffin oil: Diana process oil available from Idemitsu Kousan Co., Ltd.

Wax: SUN NOC N available from Ohuchi Shinko Kagaku Kogyo Co. Ltd.

Antioxidant: NOCRAC 6C available from Ohuchi Shinko Kagaku Co.,

Ltd.

Stearic acid: available from NOF CORPORATION

Zinc oxide 1: Zinc oxide 1 available from Mitsui Mining & Smelting Co., Ltd.

Zinc oxide 2: Zinc oxide 2 available from Mitsui Mining & Smelting Co., Ltd.

Glass fiber: Mohs hardness of 6, average fiber diameter of 33 μm, average length of 3 mm

Carbon fiber: Mohs hardness of 6.5, average fiber diameter of 18 μm, average length of 5 mm

Curing accelerator: NOCCELER CZ available from Ohuchi Shinko Kagaku Kogyo Co. Ltd.

Sulfur: Powder sulfur available from Tsurumi Chemical Co., Ltd.

Result and Discussion

As evident from the results of Table 1, in all of Experiments 1 to 4, a tire that satisfies the elements of Claim 1 of the present invention is obtained. The tires of Experiments 1 to 4 have excellent braking performance on ice and abrasion resistance.

The undersigned declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

This 8th day of March, 2004

by Akira Minagoshi

Akira Minagoshi

We, the undersigned witnesses, hereby acknowledge that Akira Minagoshi is personally known to us and did execute the foregoing Declaration in our presence on:

Date: March 8, 2004 Witness Yutaka Sakon

Date: March 8, 2004 Witness Yoji Ishihara